PROJECT NUMBER: 4009
PROJECT TITLE: Development Smoke Studies
PROJECT LEADER: B. L. Goodman
PERIOD COVERED: April, 1989

I. **Reduced Sidestream Cigarettes**:

A. **Objective**: Develop subjectively acceptable cigarettes with reduced sidestream visibility.

B. **Status**:

Trim V: Additional papers were received from Kimberly-Clark in a continuous effort to determine acceptable limits for additive levels, both from a subjective standpoint and for sidestream visibility reduction. The new series consisted of six different succinate levels ranging from 2.0% to 7.6%. The cigarette showed the expected variation in puff count and sidestream visibility, but the visibility reduction was acceptable (at least 70%) for all six models. The highest level was unacceptable from a subjective standpoint. The lowest level gave a bland taste relative to the high succinate model. Screening of the other models as well as analysis of the papers are in progress.

Bilayer papers made at the University of Maine with the same total composition as the laminated Trim V system were evaluated. One bilayer paper was made to 16 Coresta, while the other one was nonporous, and later perforated to 45 Coresta. A composite sheet with all the additives mixed together was also perforated. The three different papers performed equally well subjectively and gave similar sidestream reductions. The double wrap system from K-C gave slightly higher reduction and a better looking ash. The composite sheet burned faster than the other models, but gave similar deliveries.

Trim V cigarettes were taken to the M/C Panel for subjective comparison to a modified blend. The modified blend utilizes #8 Bright, DBC Burley, MT Oriental, and RLTC. There were no differences in mainstream deliveries or in sidestream visibility.

Lotus: A control Marlboro Lights 100 was tested on the M/C Panel for comparison with previously tested 100 mm low sidestream cigarettes made to a 24.0 circumference with the 2I low sidestream blend and 35% $Mg(OH)_2$ paper. The experimental models were made with a charcoal and a regular CA filter. Results showed no significant differences in acceptability between the cigarettes. The only significant difference was that the charcoal model gave higher off-taste. Acceptability scores ranged from 4.07 to 4.23.

Standard circumference cigarettes were also made with 35% $Mg(OH)_2$ paper, with and without different innerliners. Panelists could tell a subjective difference between single and double wraps, but there was no definite preference for either system. The double

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wrap models gave a more flaky ash, and increased the visibility reduction.

Results have been received for the cigarettes made for department wide mainstream and sidestream analysis and subjective evaluation. A conventional paper, a 35% $Mg(OH)_2$ paper, and the K-C double wrap system gave different burn rates, with tar per puff ranging from 0.92 to 1.17 mg. Marlboro and the 2I blends were used with each paper. Subjective screening indicated that all six models had different character, and will be more extensively evaluated by PED. Weight selection is in progress, and the cigarettes will be canned for future use.

II. **Sidestream Visibility Measurements**:

A. **Objective**: Determine sidestream visibility and evaluate methods of analysis.

B. **Status**: The eight port visibility instrument was used for a number of visibility measurements. Several changes were made to improve the running. Machined holders with the right dimensions for ultraslim cigarettes were received, and a new, higher capacity pumping system was installed for exhausting the smoke.

A protocol was set up for qualifying the instrument through U.S. Testing. In the first round of testing, three cigarette models of 100 mm length and standard circumference will be used; a control conventional cigarette (Marlboro Lights), a low sidestream model (35% $Mg(OH)_2$ paper), and one model giving visibility between the two extremes (single wrap K-C paper). Each model will be burned twice a day for five nonconsecutive days, after which the data will be sent out for analysis.

III. **Tipping Paper Investigations**:

A. **Objective**: Develop cigarettes with reduced levels of filter flare-up and coal drop-off.

B. **Status**: Four bobbins of iron oxide colored tipping paper were received from Ecusta: one control bobbin colored with standard iron oxide; one bobbin colored with food grade iron oxide; one bobbin colored with normal iron oxide and containing particulate magnesium hydroxide; and one bobbin colored with normal iron oxide and containing precipitated magnesium hydroxide.

Cigarettes were made in a Marlboro K.S. configuration using the four experimental tipping papers as well as production Marlboro tipping. The cigarettes were tested for filter flare-up and coal drop-off. All of the models made had 0% filter flare-up. Cigarettes made with production tipping paper had 2% coal drop-off; cigarettes made with the Ecusta control tipping paper colored with standard iron oxide had a 50% level of coal drop-off; those made with cork tipping colored with food grade iron oxide had 28% coal drop-off; cigarettes made with the tipping containing

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particulate $Mg(OH)_2$ had 0% coal drop-off; and the ones made with tipping containing precipitated $Mg(OH)_2$ had a 1% level of coal drop-off.

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